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ABSTRACT

Self-formative evaluation is a unique form of formative evaluation which refers to the involvement of both the producer and the users in the evaluation of newly developed instructional materials; it does not indicate evaluation of themselves. This examination of the feasibility of employing this evaluation technique during the process of developing instructional games addresses two clusters of questions: (1) whether the users or developers of instructional games are willing to be involved in evaluation activities, and whether they have the necessary competence to carry out such a task; and (2) whether a short training workshop is effective in imparting self-formative evaluation techniques to the users and developers of instructional games. A questionnaire, which was completed by participants in a workshop designed to train teachers to carry out self-formative evaluation of instructional games, examined both their attitudes and their ability to perform certain actions. The data collected and analyzed suggest that teachers are knowledgeable of the learner and learning task characteristics, but know little about games. A short workshop improved their evaluation competencies as well as their self-confidence for participating in the process of producing instructional games. The study concludes with recommendations and a discussion of the innovative aspects of the study. Abstracts in both English and French and 47 references are included. (Author/RP)

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SELF-FORMATIVE EVALUATION OF INSTRUCTIONAL GAMES CONDUCTED BY THE INSTRUCTOR

by

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Self-formative evaluation of instructional games conducted by the instructor

Aliza Duby

ABSTRACT

The study introduces the term "Self-formative evaluation" referring to formative evaluation of instructional games during the process of their development. Self-formative Evaluation refers to "Formative Evaluation conducted during the development of the product by its users or developers" (Duby, 1986).

An attempt is made to examine the feasibility of employing an evaluation strategy at this time. The concept of self-formative evaluation is examined in the context of using or producing instructional games.

Two clusters of questions are raised in the study testing the following:

a) Are the users or developers of instructional games willing to be involved in evaluation activities, and have they the necessary competence to carry out such a task?

b) Is a short training workshop effective in imparting self-formative evaluation to users and developers of instructional games?

The data collected and analysed suggested that teachers are knowledgeable of the learner and learning task characteristics but know only a little of games.

A short workshop improved their evaluation competences as well as their self-confidence to participate in the process of producing instructional games.

KEY WORDS

Formative-evaluation, Games, Teachers, instructional-material, Development, Instructor

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Evaluation à auto-formation destinée à être conduite par l'instructeur

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RÉSUMÉ

Cette étude propose le terme 'évaluation à auto-formation' en se référant à l'évaluation formatrice de jeux destinés à l'instruction au cours du processus de leur développement. L'évaluation à auto-formation signifie "l'évaluation formatrice effectuée pendant le développement" (Duby, 1986)

L'on tente d'examiner la possibilité d'utiliser une stratégie d'évalulation à ce stade ci. Le concept d'évaluation à auto-formation est examiné dans le contexte de l'utilisation ou de la production de jeux destinés à l'instruction.

Deux groupes de questions sont soulevées afin d'examiner les aspects suivants:

a) Les usagers et les responsables du développement de jeux destinés à l'instruction sont-ils disposés à s'engager dans des activités d'évaluation et sont-ils suffisamment compétents pour mener à bien une telle tâche?

b) Une brève session d'instruction pratique suffit-elle pour communiquer une évaluation à auto-formation aux usagers et aux responsables du développement de jeux éducatifs?

Les renseignements réunis et analysés suggèrent que les instructeurs portent des connaissances en ce qui concerne l'élève et les caractéristiques de la tâche d'instruction, mais qu'ils connaissent mal les jeux.

A la suite d'une brève session de travaux pratiques, leurs compétences dans le domaine de l'évaluation s'améliorèrent ainsi que leur confiance en soi à participer dans le processus de production de jeux éducatifs.

MOTS CLEFS

Evaluation formatrice, jeux, instructeurs matériel destiné à l'instruction: développement, instructeur

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Self-formative evaluation of instructional games conducted by the instructor

SELF-FORMATIVE EVALUATION

A typical educational situation homologous to a cybernetic circuit in which evaluation plays the role of a feedback link closing the circuit. Evaluation activities are usually clustered in two main categories: Summative and Formative. In summative evaluation the feedback is carried out at the culmination of the educational process, while in formative evaluation the feedback occurs during the project's programming or its development.

This study is concerned with self-formative evaluation - a unique form of formative evaluation and a tool that can be used by the teacher or games' producer alike in the process of making and/or improving instructional games.

The terms self-evaluation refers to the instructional material's producer and user's involvement, in the evaluation process of instructional newly developed material and does not indicate evaluation of themselves.

By shifting the responsibility of the quality of the game from the external evaluator to the producer and end-user, the latter's involvement in the games production and his interest in utilising the game for making the best of it, is increased.

Because formative evaluation is integrated in the development procedures from the developmental phases of the game, it serves as an instant tool for:

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a) improving games

b) it follows that the product which has been formatively evaluated is of a higher quality than instructional games produced without formative evaluation.

c) The teacher (producer and user) who also functions as the evaluator, is thus better informed because of his personal involvement in the evaluation activities.

d) The teacher is thus motivated to be involved in the development and adaptation of instructional games.

1) The user himself controls the information and therefore is highly motivated to collect data which are most relevant to his problems.

2) The feedback obtained can be immediately put into use, without the need to take advantage of a mediator to communicate the information. (That speeds up and betters the communication)

3) Carrying out self-evaluation of any type implies involvement and participation in the process of decision-making and thus ensuring the maximum suitability of the materials to fulfil their intended functions.

4) The absence of distance between developers and evaluators.

5) The possibility of simultaneous planning of development and evaluation.

6) The reduction of the threat associated with activities of an external evaluator.

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7) The situation of self-evaluation increases awareness of the benefits to be gained from an evaluation.

8) An individual who has carried out self-evaluation activities will later show a greater openness to an evaluation carried out by others.

9) Self-evaluation is a powerful tool for self-improvement.

GAMES

It can be said that games may be used as a medium for teaching objectives if the objectives, the learners and the game are under the teacher's control and designed or selected by him. The teacher is instructed to check the appropriateness of the game to achieve his instructional objectives (Stolovitch & Thiagarajan, 1980). Techniques of "unloading" a game from its content and using its "frame" to be reloaded with an educational message are part of the instructional-game design carried out by the instructor. Such games are supposed to serve as an attractive medium, preferred to the conventional teaching method or media because the enjoyment that they offer (Cordon, 1972; Stolovitch and Thiagarajan, 1980) when studying certain contents by certain pupils on certain occasions.

Games include more than merely the "hardware" of the "frame" of the message. They are the medium that offers the carrier the method and the software. This concept agrees with Marshall McLuhan, who says that "the medium is the message", and the two cannot conceptually be separated one from the other. Nonetheless, according to Duke (1974), there is strong evidence that, when it is treated with the same precision and understanding as traditional forms of communication, it will prove to be very useful.

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Well-designed educational games provide an opportunity to learn, filtering out the excessive noise of the real world and providing the player with a purposefully structured learning situation. Thus they help the student to focus on the main object. To function in the game the player must master the contents at such a level that he can apply them in the game, in other words, master the principles of the subject studied (De Vries, Slavin, Fenessey, Edwards and Lombard, 1980; Duke, 1974).

OBJECTIVES OF THE STUDY

The overall goal of the study is to examine the feasibility of employing self-formative evaluation techniques during the process of developing instructional games.

The explicit objectives of the study are

a. Objectives concerning self-formative evaluation;
b. Objectives concerning the effectiveness of training for improving self-evaluation.

Objectives concerning self-formative evaluation

Both affective and cognitive aspects of self-formative evaluation were examined to answer the following questions:

a) What is the attitude of the users of instructional games towards taking part in the process of games development and towards participating in self-formative evaluation activities?

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b) What is the attitude of teachers toward using new technology type, instructional games, in their classes?

c) Have the users of the instructional games (the teachers) the ability to evaluate content characteristics of instructional games?

d) Do the users have the ability to assess the intellectual characteristics of the learners and to evaluate the congruence of instructional games to the unique needs of a particular learner group?

e) Can teachers evaluate the medium-unique characteristics of instructional games?

Objectives concerning the medium (Games)

Does practising the evaluation of instructional games in their development stage or adaptation stage ensure a better choice of instructional games? (design, or adaptation?)

Objectives concerning training effects of the workshop

Respondents to the questionnaires used in this study participated in a two-day workshop, in which they learned about the meaning of formative evaluation and became acquainted with strategies of carrying out self-formative evaluation integrated into the games development. This development facilitated a response to another question: Does participation in a short training workshop change the affective and cognitive behaviours of teachers in self-formative evaluation?

THE CONCEPTS BEHIND THE QUESTIONNAIRES

The questionnaires used for data-collection in this study

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have two main components: one examines attitudes and the other examines the ability to perform certain actions. The attitude component is further subdivided into measures of attitude to formative evaluation and attitude to taking maximum advantage of the uniqueness of games. The ability component of the questionnaires is structured according to an overlap conceptualisation of the three main factors which the instructor has to consider in the teaching-learning situation. The relation between these factors is illustrated in Figure 1.

FIGURE 1

The intersections of the three circles produce segments of three types, as illustrated in Figure 2.

FIGURE 2

The first type of segment (1) located at the intersection of all three circles, represents an ideal target for game development and evaluation.

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The overlap zone (Figure 2) which is the focus for evaluation can be conceptualized in a three-dimensional model as represented in Figure 3.

FIGURE 3

The three-dimensional representation has its conceptional roots in Piaget's theory (Piaget, 1952, 1957) and in Guilford's sychomotoric components of the intellect.

This implies that abstract thinking is a natural process which starts in the new-born child and develops gradually from concrete thinking, via collecting associations experience and

practising generalisations, into abstract thinking which is the adult's way of thinking (Minkowich 1966). This behavioural approach results in including concrete thinking elements while teaching the very young children aged 2 - 5 years, and generalisation of concrete elements while teaching children aged 6 - 9 (Piaget, 1957).

THE WORKSHOP

Its purpose was to train teachers to carry out self-formative evaluation of instructional games. The workshop consisted of four successively presented phases.

The first phase consisted of a series of brief lectures about topics such as "hardware" and "software" with regard to educational games, instructional games as an educational medium, selecting an instructional medium, self-formative evaluation, particular qualities of games, affective qualities of games and defining the objective to fit the specific learning problem. The first phase culminated in demonstrating instructional games before the participants. Four main groups of games were demonstrated, each of them representing a unique strategy of teaching.

The second phase consisted of activities related to developing instructional games. Following a set of pre-determined rules, the teachers practised either developing new games or adapting existing ones. The teachers practised identifying instructional problems, then designed and constructed games to deal with these problems.

The third phase consisted of employing self-analysis and formative evaluation during the process of the development activities.

In the fourth phase, matters related to the creation of better instructional materials and to improving the teachers skills in using such materials were discussed and summarised.

Four instructional games were evaluated by the teachers.

The subjects, n=76, were teachers from vocational, academic, high and primary schools, working on the development of games as a part of their routine work.

Before and after the workshop questionnaires were completed by the teachers to examine their attitudes and abilities. The reason for this was to provide the researcher with evaluation feed-back about the adaptation of the self-formative approach.

For example, about attitude towards games.

Are you ready to use games as teaching aids?

Tick your answer: YES NO

If your answer is NO is it because you think that:

(You may tick one or more)

a) games are only for fun

b) they are noisy

c) games cannot help learning

d) there are no proper games available

e) you are not sure about games and you don't want to try.

f) it does not constitute an educational situation when a teacher plays with students.

If the answer is YES the reasons are that:

(you may tick one or more)

a) it's good to have fun during the lesson

b) it's the right educational situation when a teacher plays with students.

c) games could be used as teaching aids

d) when games are not available you can either buy them or make them.

e) you would like to learn more about games as teaching aids.

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The Results

The results reveale that teachers' attitudes to self-formative evaluation can be increased by a workshop, since the teachers changed their behaviour in the desired direction.

With regard to the findings related to the ability to carry out self-formative evaluation, post-workshop results were reported. The results revealed that teachers can learn the skills needed for carrying out such evaluation. This corroborates the positive view of teachers' willingness and ability to participate in curriculum action research. The term "curriculum action research" used by Stenhouse (1975) overlaps to a large extent the term self-formative evaluation used in the present study.

One may say that the few items used in this study to examine the teachers' ability to participate in self-formative evaluation, provide only scanty evidence about their ability to cope with complex situations that emerge in actual studies in curriculum evaluation. Moreover, it is true that the items contained in this study are relatively simple and that their code correct response, in most cases, coincides with the "socially desireable" response pattern. The fact that teachers revealed willingness to respond to the questions, that they considered that these questions were relevant to their work, and that they had sufficient self-confidence in their competence to answer these questions, is probably more significant.

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A graphic representation of teachers' ability to evaluate four games is presented in figure 4.

FIGURE 4.

It can be seen that the three games found to have similar characteristics while the puzzle is judged to have a low entertainment value.

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Figure 5 below, represents the profiles of two games.

FIGURE 5

While most games are characterised by a pattern similar to "From Fraction to ONe", the "puzzle" constitutes an exception, mainly due to the high rating it received on enhancing problem solving ability.

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The result suggests that teachers do differentiate among the qualities of games and beyond a generalised attitude towards educational games, they develop a specific attitude towards each game, furthermore they make distinctions between various advantages and disadvantages of each game.

In the same way teachers showed ability to evaluate the logical qualities and internal structure of the physical qualities of games.

Recommendations

Teachers should learn to identify specific problems and difficulties related to the attainment of a particular instructional objective. They also should learn to identify unique features and strong points of various media in order to be able to create an adequate match between the characteristics of the learners, the nature of the instructional objective and the features of the media.

To train teachers to acquire these skills, it is useful to run short workshops that focus on the cognitive, affective and psychomotor (or manipulitive-operative aspects) of participating in the production of instructional aids.

The workshops should focus on increasing the teachers' self-confidence in getting involved in self-evaluation activities related to utilising instructional aids, on co-operating with teams in developing such aids, and daring to do development work by themselves.

As far as possible, formal workshops should be conducted to learn about problems related to formative evaluation and to incorporate in the process of developing games the concept of self-formative evaluation.

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In this respect the researcher member of the team should assume a leading role.

Such workshops should aim to increase the ability of the professional to communicate with experts from other fields of specialisation and to participate in the process of deliberation, which may lead to material adaptation of experts' opinions as well as conflict situations which will be resolved in the workshop (Fox, 1985).

This study has demonstrated that evaluation serves the interest of those who co-operate in the process of development. Slowing down the process of production in the phases of a particular programme and employing formative evaluation devices may shorten the total time needed to complete a programme, and may reduce the cost of development by avoiding certain flaws which may create great delays in the later phases of developing a particular game.

INNOVATIVE ASPECT OF THE STUDY

The purpose of the present study was to explore the feasibility of using "self-formative evaluation" during the process of developing games. In the past two decades formative evaluation has been extensively used both for evaluating pupils' learning (Bloom, Hasting & Madeus, 1971) and for evaluating instructional materials e.g. Gall, (1981). Also self-evaluation has been extensively utilised for evaluating the attainment level of the individual learner e.g. Loper (1984), and the effective functioning of educational institutes e.g. Roderick (1984).

Consequently it can be said that neither formative evaluation

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nor self-evaluation constitutes a novel conception in the field of evaluation. Nevertheless, the combination of the two concepts into a single one and the utilisation of the idea of "self-formative evaluation" in a games development situation can be considered an innovative approach, as its thorough examination may contribute to the advancement of our knowledge in the fields of evaluation and instructional materials design. Moreover, the application of self-formative evaluation to problems of developing new technology-based instructional aids is especially important since, because of the complexity of such aids, those who participated in their development have in the past stayed away from getting personally involved in evaluation studies.

The validation of the concept of self-formative evaluation not only constitutes a theoretical innovation in the field, but also entails advantages in comparison to evaluation carried out by external evaluation agencies. Three such advantages were spelled out in the study:

a) The user himself controls the information and therefore one may assume that he will be highly motivated to collect data which are most relevant to his problems.

b) The feedback obtained can be immediately put into use, without the need to take advantage of a mediator to communicate the information.

c) Finally, carrying out self-evaluation of any type implies involvement and participation in the process of decision-making on behalf of those who use these instructional aids in their classes.

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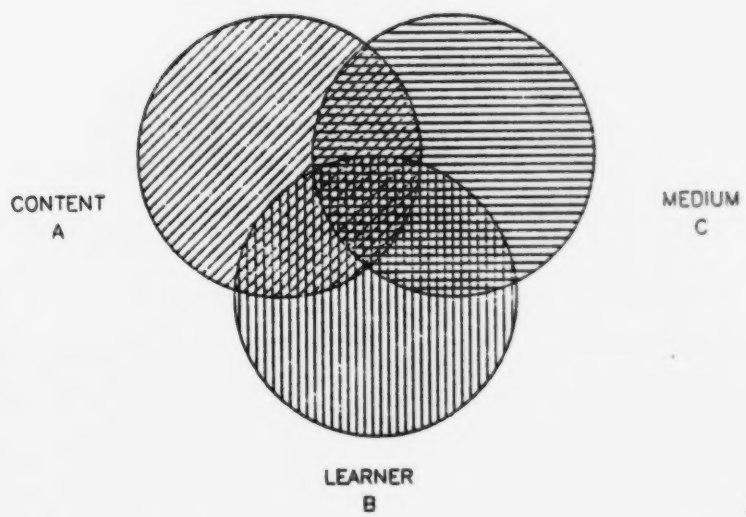

FIGURE 1: OVERLAP ZONE OF THREE OF THE FACTORS TO BE CONSIDERED BY THE EVALUATOR

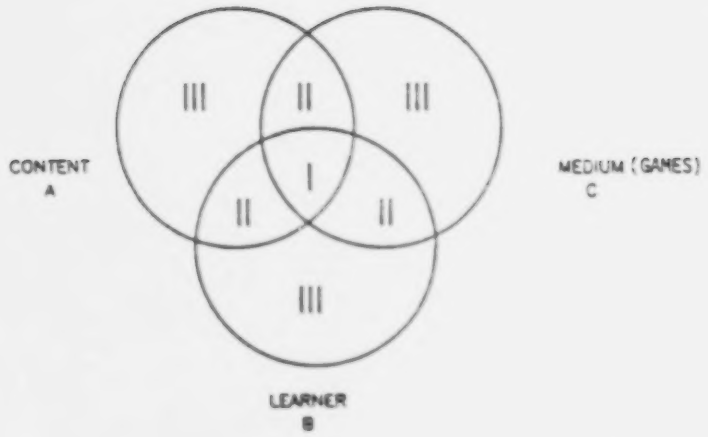

FIGURE 2: THREE TYPES OF SEGMENTS IN THE THREE FACTORS OF THE TEACHING-LEARNING SITUATION MODEL

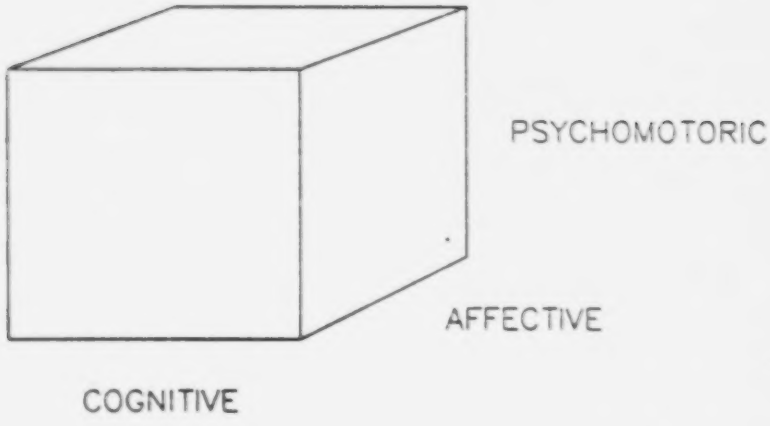

FIGURE 3: THE THREE DIMENSIONS OF THE LEARNER'S INTELLECT

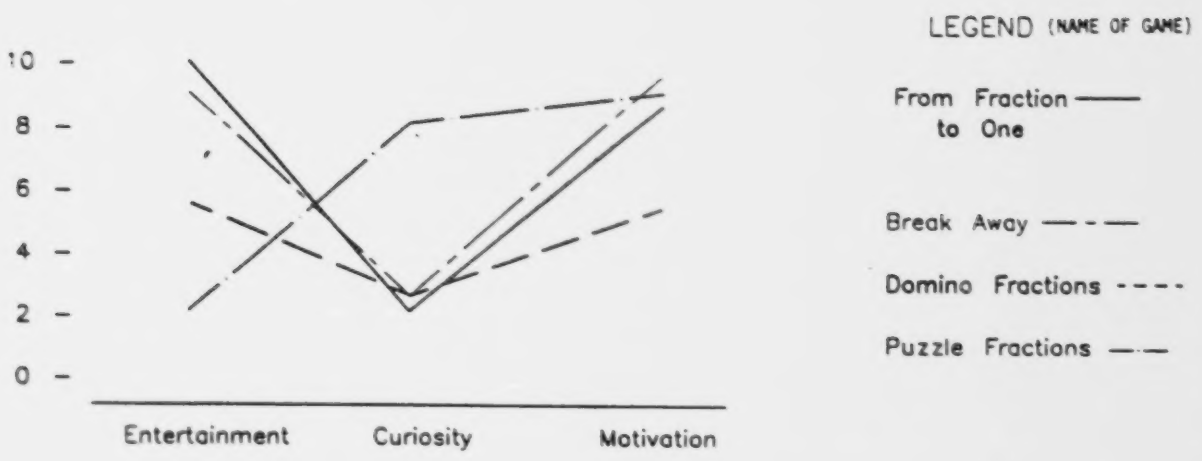

FIGURE 4: The Games' Potentials in Entertainment, Curiosity and Motivation

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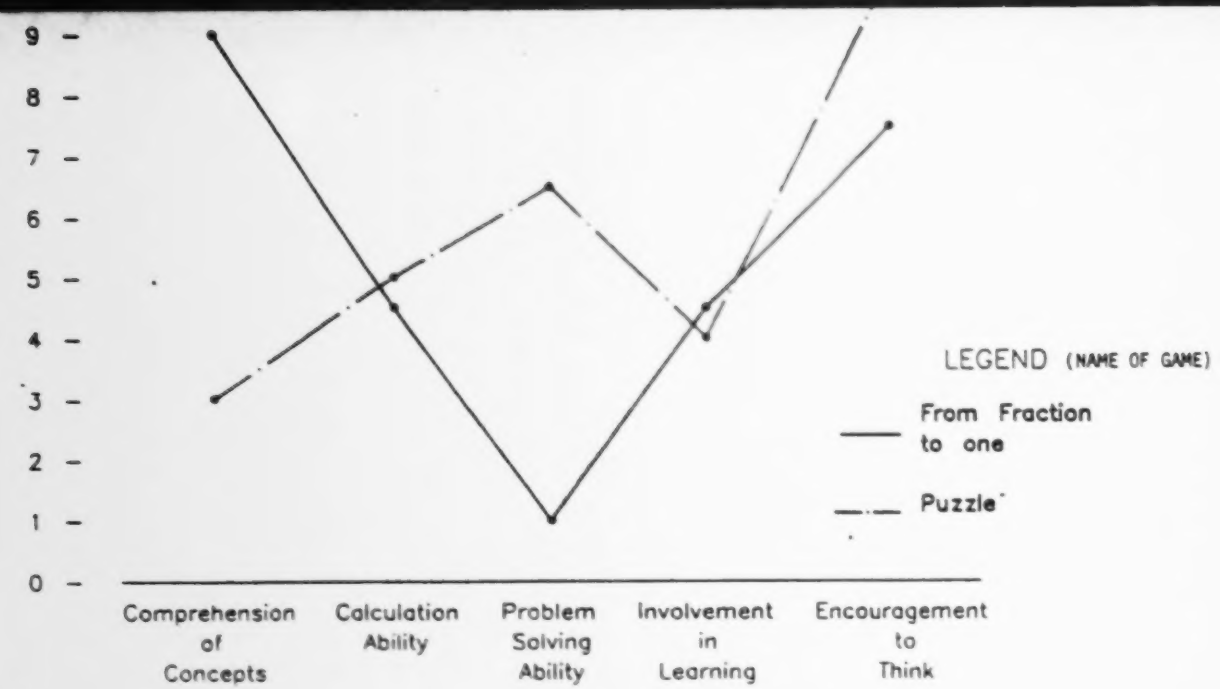

FIGURE 5: Profiles of Cognitive Variables of Two Games © Duby